

### IN THE CLAIMS

Please amend the claims as follows.

- C1
1. (Canceled)
  2. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, mountable to provide stiffening support to one of a thin-core and coreless substrate of an integrated circuit printed circuit board (IC-PCB) carrier package.
  3. (Original) An IHS/IS as claimed in claim 2, the package being one of a pinned grid array (PGA), and a ball grid array (BGA) carrier package.
  4. (Original) An IHS/IS as claimed in claim 2, the package being one of a flip chip pin grid array (FC-PGA), and a flip chip ball grid array (FC-BGA) carrier package.
  5. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, the IHS/IS substantially made of a thermally conductive material in a form of one of a molded, stamped, etched, extruded and deposited IHS/IS, and is capable of withstanding temperatures of at least normal IC operation.
  6. (Currently Amended) An Integrated Heat Spreader / Integrated Stiffener (IHS/IS) mountable to provide stiffening support to a substrate, the heat spreader/integrated stiffener including a side wall portion to mount transverse to the substrate and a stiffener extension to extend from the side wall portion toward a center of the heat spreader/integrated stiffener ~~An IHS/IS as claimed in claim 1~~, the stiffener extension comprising ~~having~~ an integrated stiffener extension which is substantially planar for mounting and mounted to a substantially planar die-side surface of the substrate.

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7. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, the IHS/IS having an internal cavity therein to provide clearance for at least one of a die, underfill, and die side component (DSC).

8. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, the IHS/IS having separate multiple attachment parts.

9. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, having a mountable above-substrate cavity-height which is one of equal to, and greater than, an above-substrate height, of a mounted IC-die.

10. (Currently Amended) An Integrated Heat Spreader / Integrated Stiffener (IHS/IS) mountable to provide stiffening support to a substrate, the heat spreader/integrated stiffener including a side wall portion to mount transverse to the substrate and a stiffener extension to extend from the side wall portion toward a center of the heat spreader/integrated stiffener ~~An IHS/IS as claimed in claim 1~~, the IHS/IS having a mountable bottom surface of the stiffener extension which is substantially co-planar with and mounted to a top die-side surface of the substrate. ~~a combination of an IC die with interface material.~~

11. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, the IHS/IS being mountable to support a heat sink.

12. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, the IHS/IS having an integrated cooling structure.

13. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, the IHS/IS being electrically connected to the substrate.

14. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, the IHS/IS being electrically insulatable from the substrate.

15. (Withdrawn) An IHS/IS as claimed in ~~claim 1~~ claim 10, the integrated stiffener portion being an edge/ring stiffener mountable to minor-planar side surfaces of the substrate.

16. (Withdrawn) An IHS/IS as claimed in ~~claim 1~~ claim 10, the integrated stiffener portion being an edge/ring stiffener having a non-flat cross section mateable with side surfaces of the substrate.

17. (Canceled)

18. (Canceled)

19. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the package being one of a pinned grid array (PGA), and a ball grid array (BGA) carrier package.

20. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the package being one of a flip chip pin grid array (FC-PGA), and a flip chip ball grid array (FC-BGA) carrier package.

21. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS substantially made of a thermally conductive material in a form of one of a molded, stamped, etched, extruded and deposited IHS/IS, and is capable of withstanding temperatures of at least normal IC operation.

22. (Currently Amended) A carrier package comprising:  
one of a thin-core and coreless substrate of an IC-PCB; and  
an IHS/IS mounted to provide stiffening support to said substrate, the IHS/IS including a side wall portion to mount transverse to the substrate and a stiffener extension to extend from the side wall portion toward a center of the IHS/IS as claimed in claim 18, the stiffener extension comprising an integrated stiffener extension which is substantially planar and mounted to a substantially planar die-side surface of the substrate.

23. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS having an internal cavity therein to provide clearance for at least one of a die, underfill, and die side component (DSC).

24. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS is attached as multiple parts.

25. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS having an above-substrate cavity height which is one of equal to, and greater than, an above-substrate plane-height of an IC-die.

26. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS having a bottom surface which is substantially co-planar with a top surface of a combination of an IC-die with interface material.

27. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS having a support portion to support a heat sink.

28. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS having an integrated cooling structure.

29. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS being electrically connected to the substrate.

30. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS being electrically insulated from the substrate.

31. (Withdrawn) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS having an edge/ring stiffener mounted to minor-planar side surfaces of the substrate.

32. (Withdrawn) A carrier package as claimed in ~~claim 18~~ claim 22, the IHS/IS having an edge/ring stiffener having a non-flat cross section, mated with side surfaces of the substrate.

33. (Canceled)

34. (Canceled)

35. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the carrier package being one of a pin grid array (PGA), and a ball grid array (FC-BGA) carrier package.

36. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the carrier package being one of a flip chip pin grid array (FC-PGA), and a flip chip ball grid array (FC-BGA) carrier package.

37. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, where the IHS/IS is substantially made of a thermally conductive material in a form of one of a molded, stamped, etched, extruded and deposited IHS/IS, and is capable of withstanding temperatures of at least normal IC operation.

38. (Currently Amended) A packaged IC integrated circuit (IC) comprising:  
an IC-PCB carrier package including one of a thin-core and coreless substrate; and  
an IHS/IS mounted to provide stiffening support to said substrate, the IHS/IS including a side wall portion to mount transverse to the substrate and a stiffener extension to extend from the side wall portion toward a center of the IHS/IS~~as claimed in claim 34~~, the stiffener extension comprising an integrated stiffener extension which is substantially planar and mounted to a substantially planar die-side major planar surface of the substrate.

AMENDMENT UNDER 37 C.F.R. 1.116 – EXPEDITED PROCEDURE

Serial Number: 09/964494

Filing Date: September 28, 2001

Title: HEAT SPREADER AND STIFFENER HAVING A STIFFENER EXTENSION (As Amended)

Assignee: Intel Corporation

Page 8

Dkt: 884.A34US1 (INTEL)

39. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS having an internal cavity therein to provide clearance for at least one of a die, underfill, die-side component (DSC).

40. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS having multiple attached parts.

41. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS having an above-substrate cavity-height which is one of equal to, and greater than, an above-substrate height of a mounted IC-die.

42. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS having a bottom surface which is substantially co-planar with a top surface of a combination of an IC-die with interface material.

43. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS having a support portion to support a heat sink.

44. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS having an integrated cooling structure.

45. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS being electrically connected to the substrate.

46. (Currently Amended) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS being electrically insulated from the substrate.

47. (Withdrawn) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS being an edge/ring stiffener mounted to minor-planar side surfaces of the substrate.

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Page 9

Dkt: 884.A34US1 (INTEL)

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48. (Withdrawn) A packaged IC as claimed in ~~claim 34~~ claim 38, the IHS/IS being an edge/ring stiffener having a non-flat cross section mated with side surfaces of the substrate.

49. (Canceled)

50. (Canceled)

51. (Currently Amended) A heat spreader/stiffener device ~~as claimed in claim 50~~, comprising a thermally conductive member having a side wall portion and a stiffener portion mountable to one of a thin-core and coreless substrate so as to increase a stiffness thereof, the stiffener portion to extend from the side wall portion toward a center of the heat spreader/stiffener device and having a stiffener extension bottom surface being substantially planar to facilitate mounting to a substantially planar die-side surface of the substrate, the heat spreader/stiffener device having a thermal path thermally connectable to the substrate.

52. (Currently Amended) A heat spreader/stiffener as claimed in ~~claim 50~~ claim 51, the heat spreader/stiffener having a hollow frame shape to allow clearance for other components on the substrate.

53. (Currently Amended) A heat spreader/stiffener as claimed in ~~claim 50~~ claim 51, the heat spreader/stiffener mountable to support a heat sink.

54. (Withdrawn) A heat spreader/stiffener as claimed in ~~claim 50~~ claim 51, the stiffener portion being an edge/ring stiffener extension mountable to minor planar side-surfaces of the substrate.

55. (Canceled)

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56. (Currently Amended) An IC carrier package as claimed in ~~claim 55~~ claim 57, the carrier package being one of a pinned grid array (PGA) carrier package and a ball grid array (BGA) carrier package.

57. (Currently Amended) An integrated circuit (IC) ~~IC~~ carrier package comprising:  
an IC;  
at least one of a thin-core and coreless substrate; and  
a heat spreader/stiffener device with a thermally conductive member having a side wall portion and a stiffener portion mounted to the substrate so as to increase the substrate stiffness, the stiffener portion to extend from the side wall portion toward a center of the heat spreader/stiffener device, the heat spreader/stiffener device having a thermal path thermally connected to the substrate as claimed in claim 55, a stiffener extension bottom surface substantially planar and mounted to a substantially planar die-side surface of the substrate.

58. (Currently Amended) An IC carrier package as claimed in ~~claim 55~~ claim 57, the heat spreader/stiffener device having a hollow frame shape to allow clearance for other components on the substrate.

59. (Currently Amended) A carrier package as claimed in ~~claim 55~~ claim 57, the heat spreader/stiffener having a portion to support a heat sink.

60. (Withdrawn) A carrier package as claimed in ~~claim 55~~ claim 57, the stiffener portion being an edge/ring stiffener extension mounted to minor planar side-surfaces of the substrate.

61. (Canceled)

62. (Currently Amended) An electronic system as claimed in ~~claim 61~~ claim 66, the IC carrier package being one of a pinned grid array (PGA) carrier package and a ball grid array (BGA) carrier package.



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Page 11

Dkt: 884.A34US1 (INTEL)

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cont.  
63. (Currently Amended) An IHS/IS as claimed in ~~claim 1~~ claim 6, the stiffener extension extending from a lip of the substrate towards a center of the substrate.

64. (Currently Amended) A carrier package as claimed in ~~claim 18~~ claim 22, the stiffener extension extending from a lip of the substrate towards a center of the substrate.

65. (Currently Amended) An electronic system as claimed in ~~claim 64~~ claim 66, the stiffener extension extending from a lip of the substrate towards a center of the substrate.

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Please add the following new claims:

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66. (New) An electronic system comprising:  
an IC carrier package including an IC;  
at least one of a thin-core and coreless substrate; and  
a heat spreader/stiffener device with a thermally conductive member having a side wall portion and stiffener portion mounted to the substrate so as to increase the substrate stiffness, the stiffener portion to extend from said side wall portion toward a center of the heat spreader/stiffener device and mounted to a substantially planar die-side surface of the substrate, the heat spreader/stiffener device having a thermal path thermally connected to the substrate.

67. (New) An IHS/IS as claimed in claim 6, wherein the die-side surface of the substrate is opposite a pin-side surface of the substrate.

68. (New) An IHS/IS as claimed in claim 6, wherein a combination of an IC-die with interface material is mounted in between the top die-side surface of the substrate and a main portion of the heat spreader/integrated stiffener.

69. (New) An IHS/IS as claimed in claim 6, wherein the integrated stiffener extension has an bottom surface that is substantially coplanar with and mounted to the die-side surface of the substrate.

70. (New) A heat spreader/stiffener device capable of being mounted to one of a thin-core and a coreless substrate and comprising:

a main portion extending along the substrate;

a first side wall portion coupled with the main portion and extending between the main portion and the substrate; and

a first stiffener portion mountable to the substrate so as to increase a stiffness thereof, the first stiffener portion extending from the first side wall portion toward a center of the heat spreader/stiffener device, the first stiffener portion having a stiffener extension bottom surface being substantially planar to facilitate mounting to a substantially planar die-side surface of the substrate.

71. (New) The device of claim 70 further comprising a second side wall portion coupled with the main portion and extending between the main portion and the substrate, wherein the second side wall portion is on the opposite end of the main portion from the first side wall portion; and

a second stiffener portion mountable to the substrate so as to increase a stiffness thereof, the second stiffener portion extending from the second side wall portion toward the center of the heat spreader/stiffener device, the second stiffener portion having a stiffener extension bottom surface being substantially planar to facilitate mounting to the substantially planar die-side surface of the substrate.

72. (New) The device of claim 71 further comprising third and fourth side wall portions coupled with respective third, and fourth stiffener portions.

73. (New) The device of claim 72 wherein the first, second, third, and fourth stiffener portions form a substantially rectangular window footprint.

74. (New) The device of claim 72 wherein the first, second, third, and fourth stiffener portions form a rectangular window footprint with curved edges.

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**Page 13**

Dkt: 884.A34US1 (INTEL)

c2 75. (New) The device of claim 72 wherein the first, second, third, and fourth stiffener portions form four corner stiffening portions, each having a triangular footprint.

76. (New) The device of claim 70 wherein the first stiffener portion extends toward the center of the device, and extends away from the center of the device.

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